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AUTHOR Adams, Wayne V.
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ABSTRACT

Guessing patterns differ between children of lower and middle class. It is hypothesized that lower class children, because they live in an environment affording fewer rewards for problem solving, come to expect a lower degree of success than their middle class peers. Eighty white kindergarten children attending urban public school were divided into groups of lower and middle class and given a two-choice card task. Two maintained and shifted card ratios were presented. Results lend support to the above hypothesis as the lower class children displayed less variable behavior on binary-choice responses. Social class similarities in problems solving behavior are also discussed. (Author/MK)

Socio-Economic Differences in Guessing Strategy On a Binary-Choice Task

Wayne V. Adams

Colgate University

Investigating the performance of mentally retarded and normal children on a three-choice probability learning task, Stevenson and Zigler (1958) showed that the mentally retarded Ss selected the event having a higher probability of reward significantly more than the normal children. To explain these findings the authors suggested that children learn to expect certain frequencies of reward on the basis of their everyday experience. Therefore, children living in a normally responsive environment would learn to expect more reward for their performance than would children living in an institution. Subjects with high expectancies would show a relatively low frequency of choice of the rewarded stimulus because they would habituate less to a response only partially rewarded. Stevenson and Zigler reasoned that this would result from the attempt by Ss with higher expectancies of reward to seek a means by which they could obtain a frequency of reinforcement corresponding to the frequency to which they were accustomed. Attempting this, "high expectancy" subjects would habituate less.

The present study employed Stevenson and Zigler's rationale and assumed that lower-class children receive fewer rewards for prob-lem-

solving behavior, and as a consequence have a lower expectancy of reward than their middle-class peers. Thus, since middle-class children should attempt to maximize reward, it was hypothesized that the probability choice of a binary-choice probability learning task would be selected more by the lower-class than the middle-class children.

Recently, Odom (1967) reported differences in probability learning performance between lower- and middle-class Negro children when presented a three-choice problem. Though Odom did not consider the Stevenson and Zigler rationale, the findings were consistent with it. In addition to employing a somewhat different task and racially different sample, the present study planned to use a covariate design, rather than equating SE groups on I.Q. as Odom did; it was felt that lower- and middle-class children of comparable I.Q. might not be representative of their respective SE classes. Also, the effect of a former reward schedule upon a new schedule was investigated by using a reward schedule shift during the choice task.

Method

Subjects

Eighty, white kindergarten children attending public, urban elementary school served as subjects. Half of the sample (Group M) was classified as middle-class children based upon the criterion that at least one parent was a college graduate and the father held a professional or semi-professional vocational position, professional and semi-professional being defined in terms of Warner's (1949) social scale. The other half of the sample (Group L) was classified as lower-class based upon a

criterion that neither parent finished high school and the occupational level of either parent was categorized as semi-skilled or lower. The Ss were selected randomly from among children of the appropriate socio-economic classifications.

Within each socio-economic (SE) classification children were assigned randomly to one of four experimental groups with the condition that each group contain an equal number of boys and girls. The mean age of Ss in Group L was 66.4 months and the mean age of Ss in Group M was 67.3. Mean scores obtained in the Peabody Picture Vocabulary Test (Dunn, 1965) showed that the I.Q. of Group M was 109.4 and Group L, 95.8; this difference was statistically significant ($t = 3.76$, $df = 78$, $p < .01$).

Materials

The stimuli consisted of 4 x 6 white posterboard cards onto each of which was pasted a red circle or square. The circles and squares were cut from larger sheets of posterboard into shapes of equal area, 7.1 square inches. A pilot study showed there were no shape preferences for either SE class.

The cards were arranged in two packs of 54 cards each; one pack had an overall distribution of 42 cards with squares and 12 cards with circles (the 78:22 ratio pack) and the second pack had 27 squares and 27 circles (the 50:50 ratio pack). A restriction was imposed that for each block of 16 cards the overall distributions were the same, that is, either 8 squares and 8 circles, or 12 squares and 4 circles, thus limiting the length of runs of any one shape.

Procedure

Previous to the experimental task, S had met E and was administered the Peabody Picture Vocabulary Test in the experimental room. A day later the child was first shown a group of assorted toys and candies and allowed to select a toy he could win and retain. S was told he could win the toy by doing a "real good job" on a game E had brought with him. S then was seated across a table from E who showed him a card with a square (circle) on it, and was asked: "(Child's name), do you know what this is called?" After being certain that the child knew the appropriate label (or one similar such as "ball" for circle or "box" for square) for both shapes, E proceeded to tell S how to play the guessing game. S was to guess whether a circle or square was to appear before him on a card to be presented. S was shown that only a correct guess won a marble. S was informed that he had to obtain enough marbles to win the prize he had selected earlier. Marbles were dispensed manually and dropped in a clear plastic container placed in front of S. All subjects were able to label the shapes and explain the procedures for winning a toy satisfactorily.

After the first 54 trials (a single card presentation constitutes a trial); a short rest of approximately 30 seconds was given during which E asked if S was enjoying the game and reminded S of the toy he had selected and the procedure to win it. The experiment was then resumed by E saying, "Now let's try these," presenting the second pack of 54 trials.

Design

Four experimental groups, within each SE class, varied in the composition of the packs of cards to which they were exposed. Group 78/78 saw the same ratio of squares (Sq) and circles (C) on both the first and

second runs of 54 cards. Group 50/50 was composed of 27 Sq and 27 C cards on both runs. Group 50/78 was exposed to a pack of 27 Sq and 27 C on the first run and a pack of 42 Sq and 12 C on the second. Group 78/50 consisted of just the reverse of group 50/78. The first 54 trials will be referred to as the pre-shift condition and the second run as the postshift condition. Thus, within each SE class, two groups were presented a pack with a 78:22 ratio of squares to circles during the first 54 trials. Under the post-shift condition, one group of each SE class continued to receive this same ratio, while the other group was presented a 50:50 ratio pack, defined as the downward shift. Similarly, one group of each SE class was started with a 50:50 pack, and continued with this ratio during the post-shift, while the other was presented a 78:22 pack, the upward shift.

Results

The performance of Groups L and M over 12 blocks of nine trials each is shown in Figures 1 and 2. The pre-shift performances of the 78/78 and 78/50 groups, and 50/50 and 50/78 groups were pooled because their performance, as expected, did not differ. The last six blocks of trials (the post-shift condition) show all the groups, with maintained (for 78/78 and

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Insert Figures 1 and 2 about here

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50/50 groups) and shifted (78/50 and 50/78) ratios.

An analysis of covariance was initially planned with MA as the covariate. However, the correlations between MA and percent square choices within each SE class, with SE classes combined, and for each ratio group,

revealed no significant relationship (r's ranged from .010 to .161). Therefore, four analyses of variance (Winer, 1962) were computed on pre- and post-shift 78:22 ratio groups and 50:50 ratio groups. With reference to the pre-shift condition, it can be seen from Figure 1 that of the two 78:22 ratio groups, Group L gave more Sq responses than Group M, but the difference was not statistically significant ($F = 3.27$, $df = 1,36$, $p < .07$). The nonsignificant SE class difference can probably be attributed to the large variance at the beginning of the task and the crossover of performance curves during the first two blocks of trials. However, analysis of the last two pre-shift blocks of trials showed that Group L and Group M differed significantly ($t = 2.62$, $df = 78$, $p < .01$). The 50:50 ratio groups showed no SE difference over the first 54 trials or on the last two blocks of pre-shift trials.

An ANOVA of the 78:22 pack, post-shift performance showed that the lower-class Ss made more Sq responses than their middle-class peers ($F = 4.38$, $df = 1,36$, $p < .01$). The interaction between the ratio groups (78/78 and 78/50) and trials was significant ($F = 3.83$, $df = 6,216$, $p < .01$). As inspection of Figure 1 suggests, the 78/50 post-shift group showed a downward performance over trials compared to the unshifted 78/78 group. The interaction between SE class, ratio groups, and trials was also significant ($F = 2.75$, $df = 6,216$, $p < .05$), though inspection of Figure 1 does not lead to an easy interpretation. Figure 1 also suggests that both SE groups responded to the shift in a similar way; that is the slopes of the curves between blocks 6 and 8, are in effect, equal.

There were no SE or ratio group differences in the post-shift condition of groups 50/50 and 50/78. It should be noted that in each of the analyses of variance referred to above there was a significant trials effect indicating that the performance of all groups in any one pre- or post-shift condition changed over trials.

An additional analysis was computed to determine whether all eight groups differed from each other on the last two blocks of trials. The results showed a significant ratio groups effect. A Tukey test revealed that only the 78/78 groups were different from any of the others (q = 9.52, df = 4,152, $p < .05$).

As a matter of curiosity, an analysis was made of the frequency of rewards received by the groups. The relevant analyses of variance showed that both SE classes were equally rewarded over trials in the pre- and post-shift conditions for all ratio groups. Thus, even though different strategies were employed by lower- and middle-class children, neither strategy resulted in more reward.

Discussion

It was hypothesized in this study that lower-class children, because they live in an environment affording few rewards for problem-solving behaviors, come to expect a lower degree of success than their middle-class peers. In general, the results lend support to the hypothesis in that the lower-class children displayed less variable guessing behavior on the binary-choice responses. The clearest effect, as anticipated, was seen in the behavior of Groups L and M on the maintained 78:22 ratio schedule, and also in the 78/50 group, after the shift.

No SE differences were found with the 50/50 and 50/78 groups. One possible explanation suggested by the expectancy hypothesis is that lower-class, as opposed to middle-class, children can accept one error in four (75% success) but neither SE group can accept one error in two (50% success). As a consequence, both SE groups attempt to "outguess" the 50:50 sequence, resulting in approximately 50% guesses of each possible event. An alternative and more parsimonious explanation of these findings might simply state that the 50:50 ratio packs did not allow a specific strategy to be formed and thus no strategy differences would be detected.

It is possible that the findings of this study reflect more the intelligence differences between the social classes rather than any expectancies which have been socially assimilated. However, the lack of relationship between I.Q. scores and task performance was taken to mean that the guessing task was sufficiently simple that intellectual differences were not relevant. However, it may be that the Peabody test does not tap the "intelligence" used in this task though why not is not clear to the author

The results of both this and Odom's (1967) study agree that guessing patterns of lower- and middle-class children are different. Odom interprets his results as reflecting the more mature cognitive ability of the middle-class child. However, when the transitional probabilities (see Suppes & Atkinson, 1960) of the guessing behaviors of this study's subjects were computed and compared with those of younger children performing a highly similar task (Kessen & Kessen, 1961), results did not always indicate that Group M subjects had more "mature" strategies than

Group L subjects. This, in addition to the belief that this task demanded minimal cognitive ability makes the Stevenson and Zigler expectancy notion seem to be a more viable explanation of these data.

The shifting of the ratio of each of the initial ratio groups yielded unexpected and very interesting findings. Though the downward shift group (78/50), for each SE class, responded as anticipated, the upward shift group (50/78), again for each SE class, did not differ from the 50/50 group when the last two blocks of trials are considered. Obviously, if the upward shifted group noticed the ratio change, the divergence of the two different ratio groups should have been greatest at the last two blocks of trials.

That the downward shift should be accomplished and not the upward, makes sense if one considers the performance expectancy the child develops as the task evolves. The 78/50 group's pre-shift condition showed the child that by specific action on his part, namely giving more Sq than C responses, he could be rewardad a considerable number of times. When the shift occurred, he apparently readily noticed a change in the frequency of reward using his previous strategy, and thus was induced to change this now "less efficient" strategy. For the upward shift groups, the initial reward pattern was random so that the children had come to expect that they could do little to affect success. They probably resort to giving random square-circle responses independent of any strategy, the random reward schedule. When the shift occurred, the child continued his previous strategy and received about the same amount of reward as during the pre-shift condition. In effect, the child had nothing to alert him that the shift had taken place. Thus it seems that

children of lower and middle SE classes have both guessing strategy similarities as well as differences.

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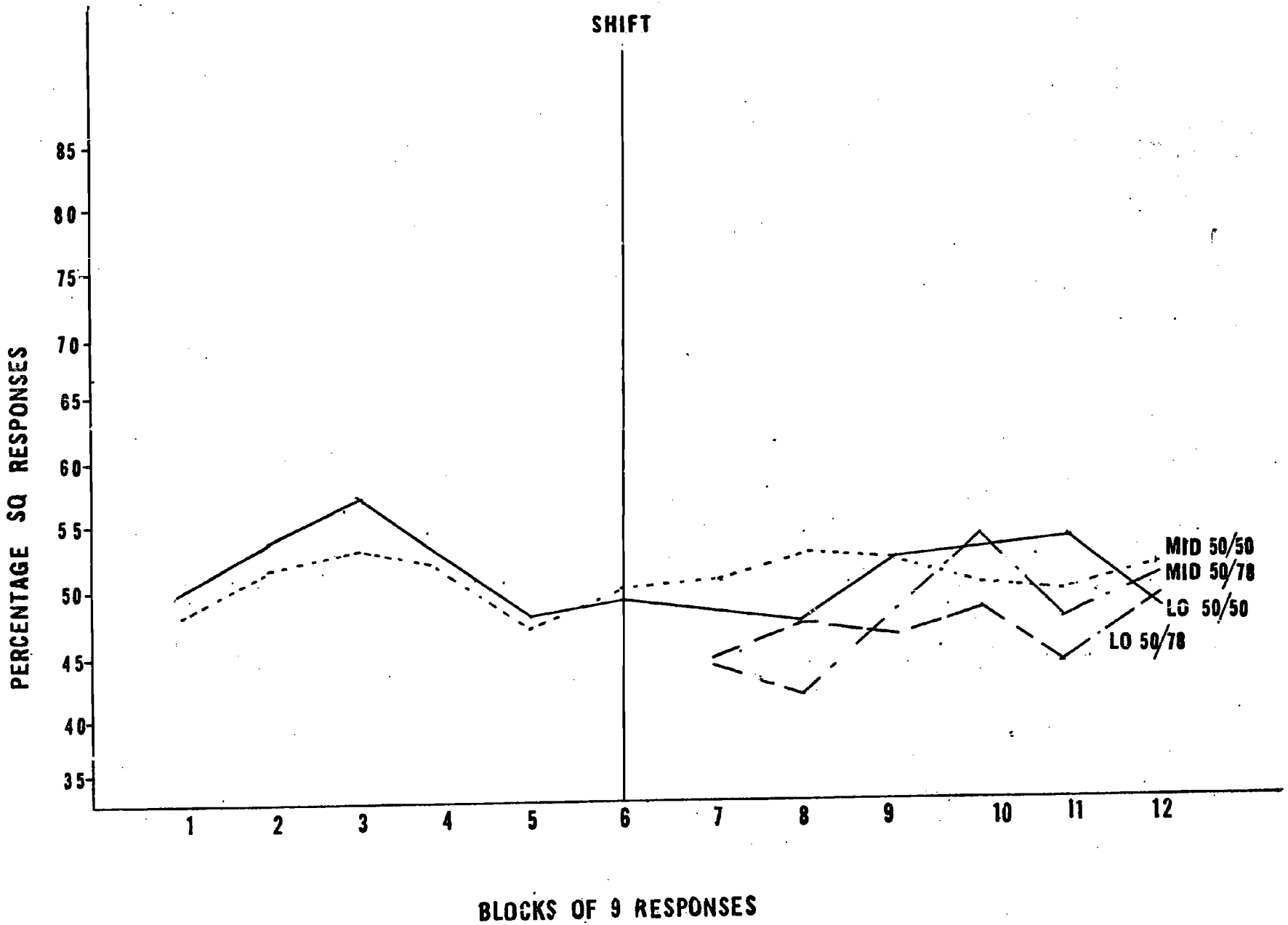
Figure Captions

Figure 1. Percentage of Sq responses for Groups M and L in pre- and post-shift conditions. The 78:22 ratio groups are shown.

Figure 2. Percentage of Sq responses for Groups L and M in pre- and post-shift conditions. The 50:50 ratio groups are shown.


SHIFT
PERCENTAGE SQ RESPONSES
85
80
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70
65
60
55
50
45
40
35
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2
3
4
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6
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10
11
12
MID 50/50
MID 50/78
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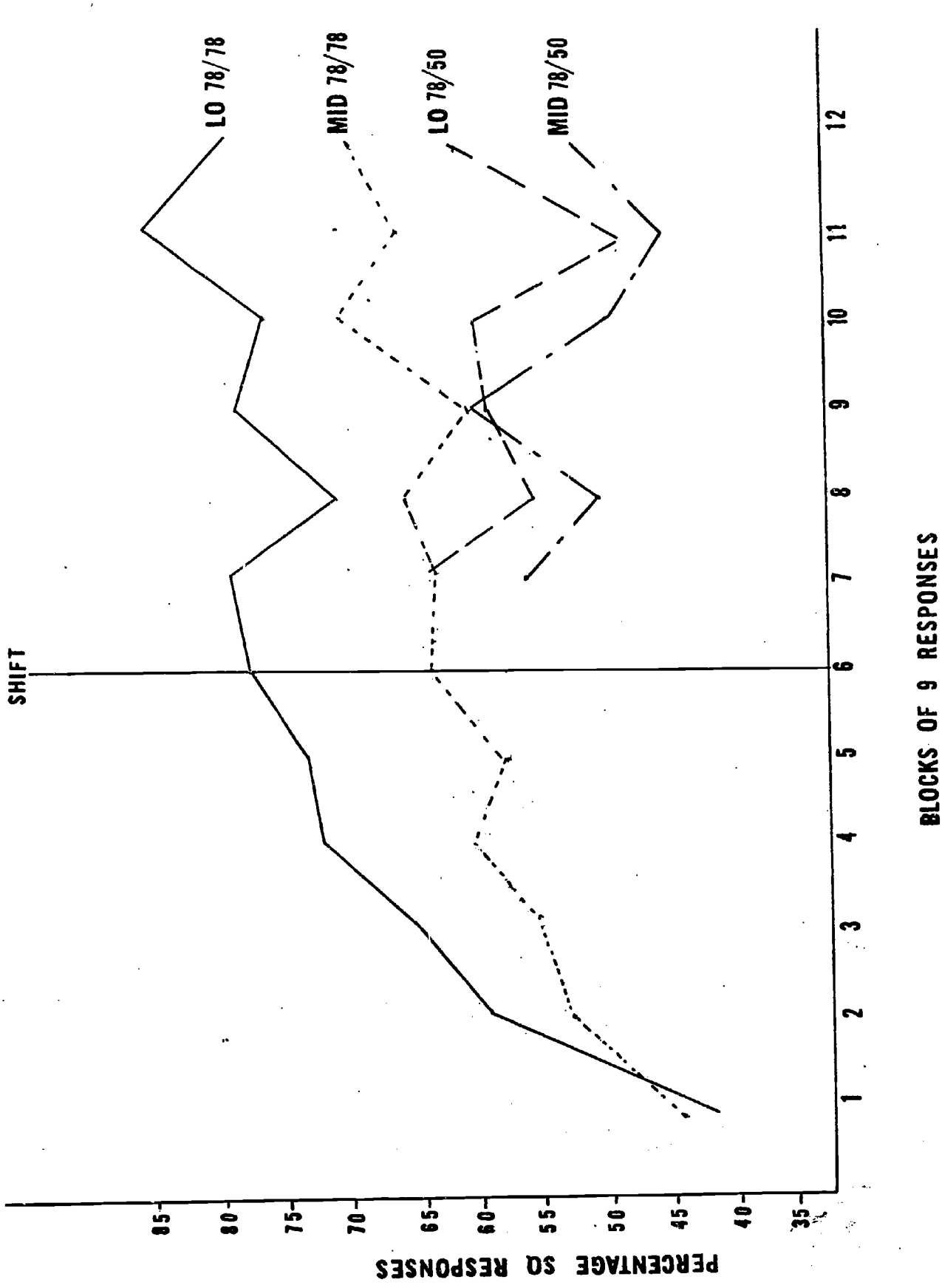
LO 50/78
BLOCKS OF 9 RESPONSES


LO 78/78
MID 78/78
LO 78/50
MID 78/50
SHIFT
PERCENTAGE SO RESPONSES
BLOCKS OF 9 RESPONSES
85
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